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IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

PATENT APPLICATION

Inventors: Young-Kai Chen
Rose Fasano Kopf
Wei-Jer Sung
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Docket No.: Chen 28-19-3-3

Serial No.: 10/624,038

Group Art Unit: 2815

Filed: July 21, 2003

Examiner: Matthew C. Landau

Title Flat Profile Structures For Bipolar Transistors

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SIR:

In response to the Examiner's Answer dated March 17, 2008, Applicants submit herewith a Reply Brief for the above-identified application.

NO ADDITIONAL FEE REQUIRED

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Respectfully,

John McCabe

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Date: May 17, 2008

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Patent Application

Inventors: Young-Kai Chen et al

Case No.: Chen 28 – 19 – 3 – 3

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Sir:

RPLY BRIEF UNDER 37 C.F.R. § 41.41

This Reply Brief is responsive to the Examiner's Answer, which was mailed on March 17, 2008.

Date of Deposit May 17, 2008

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REPLY BRIEF UNDER 37 C.F.R. § 41.41

In section 10, pages 7 – 10, the Examiner's Answer states new arguments on which the rejections of claims are based, i.e., the rejections of base claim 8.

In particular, the Examiner states:

> In the Final Rejection, the Examiner refers to element 18 (as shown in Figure 1H of Imai) as the claimed "subcollector". Applicant's [sic] arguments are based on the premise that element 18 cannot be considered a subcollector. The Examiner respectfully disagrees with this position.
>
> Appellant argues regarding the rejection of claim 8 over Imai that:
>
> "Figure 1H shows N+-type layer as being located to the side of the layer 14 and clearly identifies layer 14 as the collector. That is, the parts of Imai relied on by the final Office Action do not show the N+-type layer 18 as being below the collector 14."
>
> However, claim 8 does not require the subcollector to be "below" the collector. The word "below" is absent from claim 8. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. ... The instant specification does not provide an explicit definition of the term "subcollector" that would preclude the interpretation set forth by the Examiner.
>
> ...
>
> While the Examiner agrees that "below" is one possible meaning of the prefix "sub", it is not the only meaning. ...
>
> Terms such as "subset" and "subcombination" illustrate that the prefix "sub" has alternate meanings which have nothing to do with relative, physical locations. For instance, Merriam-Webster's Collegiate Dictionary (10^{th} edition) defines the term "sub" as "a subordinate portion of: [sic] subdivision of". Clearly a subcombination does not need to be below a combination. This is also true when referring to "subcollector". A subcollector is merely a subordinate portion of, or a subdivision of the collector. The physical location of the subcollector relative to the collector is irrelevant. In the specific example shown in Figure 1H of Imai, elements 12 and 18 are heavily doped regions that form the conductive path from collector region 14 to the collector contact (not shown). Therefore, region 18 can be considered a "subdivision" of the collector, which in turn means region 18 can be considered a subcollector. The broad interpretation set forth by the Examiner is consistent with the specification since the term "subcollector" was not explicitly defined as being "below" the collector.

Examiner's Reply, page 8 - 9 (underlining added).

In the above portion of Examiner's Answer, the Examiner implies that the rejections of the pending claims are based on interpreting "subcollector" as meaning a "subordinate portion or subdivision of the collector" rather than as being a "feature or layer that is located below the collector", as stated at page 4 of Applicants' Appeal Brief. The Examiner states that Imai's region 18 satisfies the recitations of pending claim 8 for the

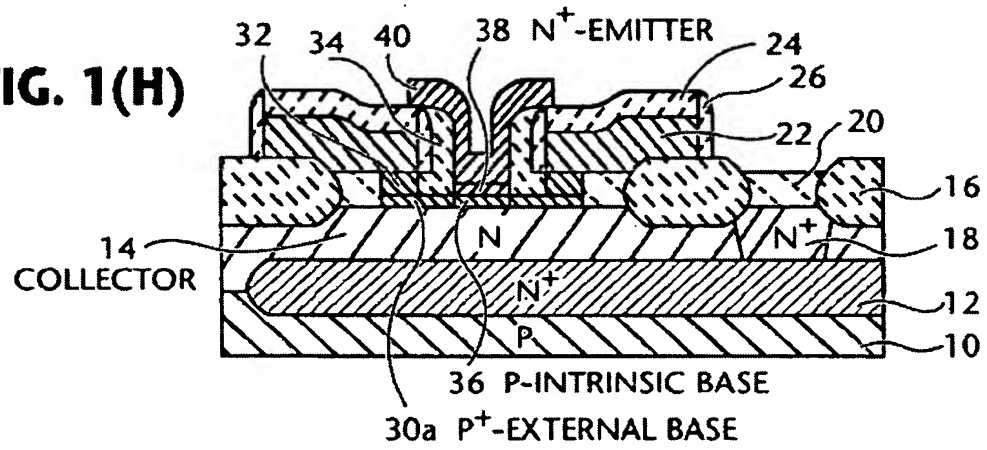
subcollector, because Imai's region 18 is such a subordinate portion of or subdivision of the collector.

The Examiner's arguments are defective for, at least, several independent reasons.

1) The Examiner has argued that Imai's region 18 is a subdivision or subportion of the conductive path between the collector 14 and a collector contact. But, the Examiner's definition is that the subcollector is a subdivision or subportion of the collector itself rather than of a conductive path from the collector. Thus, the Examiner has not provided any reason to conclude that Imai's region 18 satisfies the Examiner's definition of "subcollector". Thus, the region 18 has not been shown to be a "subcollector", as in claim 8, even if one accepts, arguendo, the Examiner's definition of "subcollector".

2) The cited portions of Imai are also inconsistent with the Examiner's assertion that the region 18 is a subordinate portion or subdivision of the collector as required in the Examiner's definition of subcollector. For example, Imai's Figure 1(H), which is shown below, does not support the Examiner's conclusion.

FIG. 1(H)



Imai's Fig. 1(H) specifically labels the layer 14 as the "COLLECTOR". In addition, Imai refers to layer 14 as the collector and refers to the region 18 as a separate feature, i.e., a collector pull-up layer. For example, Imai states:

> Next, a silicon oxide film **20** having a thickness of 80-160 nm is formed on the collector and collector pull-up layers **14**, **18**, ...

Imai, col. 3, lines 8 – 10.

Thus, Imai's Fig. 1(H) and description describe the collector layer 14 and the region 18 as physically separate features rather than describing the region 18 as a subordinate portion or subdivision of the collector layer 14. Thus, even if one accepts the Examiner's definition of "subcollector" to mean a subordinate portion of or a subdivision of the collector, Fig. 1(H) and the description of Imai are inconsistent with the Examiner's conclusion that the region 18 is a subcollector under such a definition. That is, the teachings of Imai do not support the Examiner's conclusion that the region 18 is a subcollector.

3) Imai's Fig. 1(H) specifically shows that the collector layer 14 and the region 18 as having qualitatively different compositions. The region 18 is shown as being an N^+ material, i.e., heavily doped semiconductor, and the layer 14 is shown as being an N material, i.e., ordinary extrinsic semiconductor. N^+ type semiconductor (e.g., region 18) is heavily doped to function as a conductor. In contrast, N type collector layer 14 is doped differently to function as one semiconductor layer of an NPN bipolar transistor. In light of such qualitatively different compositional and conductivity properties, it is improper to identify the region 18 as "subordinate portion or subdivision of" the collector layer 14. Instead of being a subordinate part or subdivision of the collector, the region 18 is separate from the collector layer 14 and has a different composition and function than the collector layer 14. Thus, the properties of the region 18, i.e., as taught by Imai, do not support the Examiner's identification of the region 18 as a subcollector, i.e., even according to the Examiner's definition.

4) Even if, arguendo, the Examiner's definition of a subcollector as a subordinate portion of or a subdivision of the collector was acceptable, the region 18 would still not satisfy other limitations on the subcollector as recited in pending claim 8. In particular, pending claim 8 states:

> collector, base, and emitter semiconductor layers of a bipolar transistor, the semiconductor layers forming a vertical sequence <u>on</u> the substrate ...; and ... wherein the substrate <u>includes</u> a subcollector ....

(underlining added)

Thus, pending claim 8 recites that the collector is a layer of the sequence on the substrate and that the subcollector is in the substrate. Since the collector layer is in the sequence on the substrate and the subcollector is in the substrate, the subcollector layer must be located below the collector layer. That is, these portions of pending claim 8 require that the subcollector be below the collector layer whatever the interpretation given to the prefix "sub" in the word "subcollector". Since Imai's Fig. 1(H) shows that the region 18 is to the side of the collector layer 14 rather than being below the collector layer 14, the region 18 does not satisfy the above recitations of pending claim 8, and the Examiner's rejection based on Imai is improper.

5) Even if, arguendo, the Examiner's identification of the region 18 as a subordinate portion or subdivision of a subcollector was accepted, such an identification would still not imply that Imai teaches pending claim 8. In particular, pending claim 8 also recites that:

> wherein the substrate includes a subcollector that forms an electrical contact for the collector layer, the entire subcollector being located outside of the portion of the substrate that is vertically below part of the base layer.

Thus, pending claim 8 recites that: (a) the subcollector forms an electrical contact for the collector layer, and (b) the entire subcollector is located outside of the portion of the substrate located vertically below part of the base. With respect to feature (a), i.e., being an electrical contact for the collector layer, Imai's Fig. 1(H) indicates that N^+ layer 12 is, at least, part of the electrical contact for Imai's collector layer 14. In particular, N^+ semiconductor layers are heavily doped to function as conductors, and the N^+ layer 12 is in contact with a large part of Imai's collector layer 14. In addition, the region 18 is also an N^+ layer and is in contact with the N^+ layer 12. For these reasons, if one identified the N^+ region 18 as part of the electrical contact for the collector layer 14, i.e., as done by the Examiner, one would have to identify the compositionally and functionally very similar, adjacent N^+ layer 12 as being part of such an electrical contact. Thus, the Examiner's identification of the region 18 as part of Imai's subcollector would, based on his logic, still require an identification of the N^+ layer 12 as being a part of said subcollector. Then, Imai's ENTIRE subcollector would still not be "located outside of the portion of the substrate that is vertically below part of the base layer" as recited in pending claim 8,

because the N^+ layer 12 does not satisfy such a limitation. Thus, even if one, arguendo, used the Examiner's definition of subcollector, Imai would not teach a subcollector satisfying the limitations of pending claim 8.

Due to the above-described deficiencies in the Examiner's rejection of pending claim 8, the Examiner has not provided a proper rejection of any pending claims even if a subcollector was arguendo a "subordinate portion of or a subdivision of the collector." Applicants note that they do not accept the definition of "subcollector" as stated above by the Examiner.

Respectfully,

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Date: May 17, 2008

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